ERGONOMIC STUDY ON EYE DISCOMFORT FOR USING UMP WEBSITE HOMEPAGE BY APPLYING JAKOB NIELSEN'S HEURISTICS

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ABSTRACT

UMP website is the official page to disseminate information, notification of academic and co-curricular activities involving either to students, staffs and lecturers. The usability of a user interface becomes extraordinary important and the development of the website should be in accordance with the specifications and the proper principles. Therefore, ergonomics awareness about eye discomfort is an important thing when developing a website. The purpose of an ergonomic study of eye discomfort is to raise the level of development of a website and will create awareness about the importance use of the appropriate colour, font and size when the implementation process. On awareness, the project is carried out with the objectives is to identify which part of user interface design of UMP website that extremely exposed to ergonomic eye discomfort and proposed alternatives for improvement. Method used for the data collection process is through questionnaires about existing UMP websites and involving 20 respondents including admin, staff and students for all faculties of UMP Gambang. Jakob Nielsen's heuristics principles that related to describe eye discomfort used as a technique to be applied in the development process of a website in order to gain the proper specification of implementation.

ABSTRAK

Laman web UMP merupakan laman web rasmi untuk menyebarkan maklumat, aktiviti akademik dan kokurikulum yang melibatkan pelajar, kakitangan dan pensyarah. Kebolehgunaan antara muka pengguna adalah penting dan pembangunan sesebuah laman web hendaklah mengikut spesifikasi dan prinsip-prinsip yang betul. Oleh itu, kesedaran ergonomik tentang ketidakselesaan mata merupakan suatu perkara yang penting dalam pembangunan sesebuah laman web. Tujuan kajian ergonomik terhadap ketidakselesaan mata adalah untuk meningkatkan tahap pembangunan laman web dan memberikan kesedaran tentang betapa pentingnya penggunaan warna, tulisan dan saiz yang sesuai ketika proses pelaksanaannya. Atas kesedaran itu, projek ini dijalankan dengan objektifnya adalah untuk mengenalpasti antaramuka pengguna pada laman web UMP yang sangat terdedah kepada ketidakselesaaan mata dan mencadangkan penambahbaikan. Kaedah yang digunakan bagi proses pengumpulan data adalah melalui borang kaji selidik tentang laman web UMP yang sedia ada dan melibatkan 20 responden termasuk admin, staff dan pelajar daripada semua fakulti di UMP Gambang. Jakob Nielsen's heuristik digunakan sebagai teknik yang perlu diaplikasikan dalam proses pembinaan laman web supaya pelaksanaannya adalah mengikut spesifikasi yang betul.

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CHAPTER 1

INTRODUCTION

This chapter briefly discuss on the overview of this project. It contains five parts. The first part is introduction of the project. The second part is the problem statement and motivation of this project. The third part is the objectives where the projects goals are determined. The fourth part is the scopes of the project. And finally, the thesis organization which briefly describes the structure of this thesis is described in part five.

1.1 Introduction

Improving productivity is a key factor in a growth of a University. In reality, most organizations of University work hard to look for a new ways to make their overall output more effective. In a University, success and excellence in all areas is a pride, so, improving University productivity has become an important focus of management.

Improving University productivity can be accomplished by many aspects. It simply means that, in order to maximising University productivity, there is the need to focus on areas of personal motivation and the performance of the work environment, both of which form factor that affect the productivity of University and they are related absolutely to the ergonomic principles.

Thus, the consideration of ergonomic principles in develop website are so important and need to be highlight in all work activities in order to improve productivity. Any work task in develop website carried out without considering the

ergonomic principles, the users may have exposure to undue physical stress, dizziness, sore eyes and so on.

UMP website is the main place to disseminate information, notification of academic and co-curricular activities involving either to students, staff and others. Therefore, the development of the site shall be in accordance with the specifications and the correct principles so that users feel comfortable while browsing the website. When viewing a website, eye comfort is the most important in order to make the website always have a lot of viewer. While, eye discomfort when viewing a website will cause users feel discouraged to browse it. For example, the font size which is too small or too big to use on website, not interesting color or unsuitable color pairing and bright colors is one of the causes why eye feel discomfort. Because of that, website development must to follow the guideline or right principles in order to create the best website and enhance the productivity.

However, in today's modern era the usability of a user interface becomes extraordinary important. We cannot underestimate the measuring of the usability because it can reveal the qualities of the product as well as lack of functionality, which usually arise during the design phase. Therefore, usability needs to be considered together when developing the system. To conduct the evaluation, the method used in this project is heuristic evaluation which is based on Nielsen's set of usability heuristics to implement a through and in-depth assessment.

Jakob Nielsen's heuristics is the most popular principles that applied in the development of website. Nielson defines heuristic evaluation as a measurement that utilizes heuristics in order to find usability problems (Nielson J, 1993). Nielson's method uses a small set of principles, guidelines, or heuristics that are systematically assessed against a target system in order to identify problems and their severity, as well consequences for the user. The guideline is suitable for any web application or websites.

Ergonomics or human factors is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to

optimize human well-being and overall system performance. It is also be defined as usability engineering is a discipline that investigates human or machine interface issues, using a wide array of methodologies (J Med Internet Res, 2009). The approaches for evaluating the human-computer interaction (HCI) characteristics of a system include inspection methods or user evaluations. Inspection methods are based on reviews of a system, often by experts, which can be guided by usability heuristics, user tasks, or other information.

By applying Jakob Nielsen's principles in order to create the website, eye discomfort will be overcome and the best website will be developed.

1.1 Problem Statement

UMP website is one of the website that regularly visited and use by membership of UMP especially lectures, admin and students. The UMP website developers need to ensure that there is nothing that could cause problems and discomfort to the user's navigation. Once the problem occurs, users will feel tired to use it again.

Website design by the use of appropriate colours, appropriate font, and simple design makes the website developed will not missed out to use by users because they feel comfortable when visiting it.

Eye is a major role while surfing the website. Therefore, proper care should be given to the eyes so that no occurrence of pain in the eye. Use bright colours and a variety of colours on a website can lead to eye discomfort when using the website with a long period. In addition, the use of unsuitable writing as too small or too large will also cause problems on the eye. Discomfort is a little bit of an impact when fewer users who will use the website. This problem will have an impact on productivity as UMP website is a place to disseminate information, activities and so on.

When users do not access the site, lots of information and latest activities did not know by them. Therefore, they do not involve in the program organized by the university or outside while that program is beneficial and may increase knowledge and their experience. This situation will affect academic performance and among lecturers, admin and students.

From research and survey that have done, there are many participants or testers on using UMP website who are dissatisfied with current UMP website. Therefore, the problem has attracted the interest and motivation to make a study of the case by applying appropriate techniques to solve the problem.

The usability heuristics by Dr. Jakob Nielsen Molich, R., Nielsen, J. (1990) Ed. Nielsen, J. (1994) that related in the research is first mention about the visibility of system status, second about flexibility and efficiency of use and third is consistency and standard.

1.2 Objective of the Project

1. To study the ergonomic method due to the eye discomfort while using UMP website homepage by conducting survey.
2. To identify which part of user interface design of UMP website homepage that extremely exposed to ergonomic eye discomfort.
3. To propose improvement on the website hence reduces discomfort of the eye by applying Jakob Nielsen's Heuristics of usability in prototype design development of UMP website homepage with usability testing.

1.3 Scope of the Project

1. Project only conduction on interface design of UMP website homepage.
2. The target respondents only comprises for administrator, lecturers and students of different faculty in UMP Gambang.
3. Specific Platforms: Project only be conducted using Mozilla Firefox and Windows OS as a platform.

1.4 Thesis Organization

This thesis will consist of six (7) chapters. The first chapter which is chapter 1 will explain briefly about the overview of the entire project including the problem statement of the project, objective and scope.

Literature review in Chapter 2 will explain briefly about ergonomic on eye discomfort for using UMP website. The discussion is based on the technique of ergonomics that should be applied. Detail explanations on relevant techniques are shown and evaluate in this chapter by referring to the past research findings by other researchers that related to the project in order to get complete information and knowledge.

Chapter 3 is methodology that will discuss about the software process or flow process that is used for the study of ergonomic applications. This chapter also discussed the detail about the software and hardware specification that are being used for research of this project.

After the methodology explanations, next chapter which is chapter 4 will discuss about the design on the prototype of the system. The purpose of this chapter which may consist of interface design and explain briefly on design of process that is involved during development of this prototype. Besides that, this chapter also elaborates the output of the technique and all the constraints of completing the research.

Chapter 5 is about implementation of the system. This chapter will display the prototype interface that is developed based on the principles and will be compared to the current website that is not fully apply the principles in design development.

Result and discussion will be elaborate in Chapter 6 that interprets and evaluates the finding of the technique that have been applied for ergonomic problems and the advantages and disadvantages of this technique also will be discussed.

Chapter 7 discusses and summarizes the research of ergonomic eye discomfort and solution of the case study. Recommendation and suggestion for further research of the system also will de describes in this chapter.

CHAPTER 2

LITERATURE REVIEW

This chapter briefly discusses about ergonomic study of eye discomfort and system importance and functionality. The discussion is based on the principles that should be applied in order to study on existing system method. Detail explanations on relevant principles are shown and evaluate in this chapter and also describe about knowledge and understanding in project background. Some research of tools and technology used is also discussed in this chapter.

2.1 Background of Project

Eye comfort is an important aspect when surfing such websites, social sites and others. This is to ensure that activities of browse the internet run smoothly and do not cause a problem to users. Eye comfort is closely related to human factors and ergonomic which is concerned with the "fit" between the user, equipment and their environments. It takes account of the user's capabilities and limitations in seeking to ensure that tasks, functions, information and the environment suit each user. To assess the fit between a person and the used technology, human factors specialists or ergonomists consider the job or activity being done and the demands on the user depends on the equipment used such as size, design, how appropriate it is for the task and the information used that show how it is presented, accessed, and changed. In order to ensure that, the develop of design is cover all necessary aspects and consider of the ergonomic (human factor), the implementation must follow up the standard principles and accurate guidelines.

2.2 Studies on Ergonomic

The International Ergonomic Association (IEA) defines ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that apply theory, principles, data and methods to design in order to optimized human well-being and overall system performance.

From a concise proposed by (Chapanis A., 1991) boils it down to its very fundamental nature. He defines ergonomics (human factors) is a body of knowledge about human abilities, human limitations, and other human characteristics that are relevant to design. Human factors engineering is the application of human factors information to the design of tools, machines, systems, tasks, jobs, and environments for safe, comfortable, and effective human use.

Ergonomic definitions from scientific literature (James H. Stramler, 1993) compiles and analyses that human factors is that field which is involved in conducting research regarding human psychological, social, physical, and biological characteristics, maintaining the information obtained from that research, and working to apply that information with respect to the design, operation, or use of products or systems for optimizing human performance, health, safety, and habitability.

The National Research Council (1093) said "Human Factors specialists are united by a singular perspective on the system design process: that design begins with an understanding of the user's role in overall system performance and that systems exist to serve their users, whether they are consumers, system operators, production workers, or maintenance crews. This user-oriented design philosophy acknowledges human variability as a design parameter."

By looking through all definition, it can be considered that ergonomics can be concerned with a lot of things that are not related to the “work” being done. It is a multidisciplinary activity responsible for the activities in order to bring the product, systems, jobs and environments, characteristic, limitations and needs, looking for optimize their effectiveness and to improve both health, comfort and productivity.

2.3 Studies on Eye Discomfort

Research into the human comfortable is a very important area to stay informed on and eye is an important role when browsing websites or internet. The human eye is an organ which reacts to light, font, colour and others for several purposes. Human eye is organ of vision. A vital organ of vision it plays a very important role not only in life but also the human body.

Besides that, the human eye is the organ which gives us the sense of sight, allowing us to learn more about the surrounding world than do with any of the other four senses. The eye allows us to seer and interprets the shapes, colours, and dimensions of objects in the world by processing the light that reflect or emit. The eye is able to see in bright light or in dim light, but it cannot see objects when there is no light.

Eye used to fix the eye on, to look on, to view, to observe particularly, to observe or watch narrowly, or with fixed attention and to hold in view. The eyes are attracted on simple, nice, easy to read faces and interesting design. Be aware of fonts and text sizing because they influence behaviour. Viewers tend to scan more across larger text, while smaller fonts increase focused viewing behaviour. When browse website, we may want to scan, or may want focused attention, but its decision that should be made purposefully and not randomly.

2.4 Studies on Website Design

Web design is defined as “the art and process of creating a single web page or entire web sites and may involve both the aesthetics and the mechanics of a web site’s operation although primarily it focuses on the look and feel of the web site (2010, January 19) “.

Web design is kind of like graphic design in the sense that you are styling and designing different parts of the internet. Graphic design is defined as the art or profession of visual communication that combines images, words, and ideas to convey information to an audience, especially to produce a specific effect (Van Der Sluis, B, 2004).

Website design means planning, creation and updating of websites. Website design also involves information architecture, website structure, user interface, navigation ergonomics, website layout, colours, contrasts, fonts and imagery (photography) as well as icons design.

Briefly, the meaning of design is perceived solely as a visual aspect. In reality, website design includes more abstract elements such as usability, ergonomics, layout traditions, user habits, navigation logic and other things that simplify the using of websites and help to find information faster.

Design elements and principles by (Lidwell W., 2010) stated design elements are the basic units of a painting, drawing, design or other visual piece. The elements explain that colour can play a large role in the elements of design with the colour wheel being used as a tool, and colour theory providing a body of practical guidance to colour mixing and the visual impacts of specific colour combination. The uses are colour can aid organization so develop a colour strategy and stay consistent with those colours.

Simplicity is the one of the design principles. Although gaining attention is an important part of any communication act, it is important to try to keep your message as simple as possible (Schwier and Misanchuk, 1993). Use only the amount of text and graphics as is absolutely necessary to get your point across which superfluous graphics can interfere with understanding (Anglin, Towers & Levie, 1996; Levie & Lentz, 1982) and an overabundance of fonts or colours can distract rather than assist learning.

2.5 Current Design of UMP Website

Figure 2.1: Current UMP Website

UMP website as shown in figure 2.1 is the website that be a focus point for members of the organization. As usual, university website was developed to viewing and get some information. Through UMP website, students especially are able to visit page such as e-learning in order to know the information about every subject taken and so on by login with input username and password. That means, they need to use the website every single day in long period. When the website was be a focus point, eye comfort must be an important part when view the page. From the research of UMP website, the design development is not follow the accurate rules. Font size, background color, color pairing, font type, content display, image use is not follow the website standard. On the bottom part, the font that use is too large compared to other part and will show that the design is not consistent and standard.

2.6 Case Studies

Studies on existing websites are required to study the elements that are on every website. Elements of the research includes the design, use of type and font size, use of colour and how the website give the impact on consumers whether to expert or novice user who browse the website. UTM website, UIA website and UiTM website is the example of website that have own advantages in terms of design.

2.6.1 Studies on UTM Website

UTM website as shown in figure 2.2 is the official website which developed in order to provide news or up-to-date information about their organization. The website act as gateway to all member of UTM that give benefits to them contains activity of their university, information about studies and organisation, and etc. UTM website design has a simple design interface. Amount of text and graphics that placed as is absolutely necessary to get point across and text on the website is not too much and need to click at another sub menus in order to achieve more information. Colour used is suitable and not excessive, does not cause eye discomfort particularly when visiting this site for too long. The colour that use is can categories in “save colour” because use the

whitey colours as a background and only apply no more than three colours for text and additional background.

Figure 2.2: UTM Website

2.6.2 Studies on UIA Website

Every website developed for an organization to be a focal point for members of the organization. Similarly, the UIA website as the place or space for students and staff to obtain current information, find activities that will be organized, campus news, and so on. UIA website that shown in figure 2.3 is the simplest website that has quite good and effective user interface. One element that can be highlighted is the clarity of a design. So far users are able to interact with the system by communication meaning and function. The text not too much, colours use are suitable, and no blinking text which

commonly found on a website that makes a user's eyes feel discomfort. Elements that be applied in the development of this site will facilitate whether novice and expert users.

Figure 2.3: UIA Website

2.6.3 Studies on UiTM Website

UiTM website as shown in figure 2.4 is the official website that gives advantages of using this web-based which is contain a lot of features for staff, student and admin itself. This website provides the informatiob about the univrsity in general such as the overview, academic programs, current news of university, activities and etc. UiTM website is one of the simplest features and attractive design. The development of the website decrease amount of text in the main page and spread out only one graphic which makes this website views not too dense. Standard colours are used for links and visited links and match with the background colour. One of the elements that can be

highlighted is the amount of colour of the design. It not more than three colours and is a good aspect to the designing website.

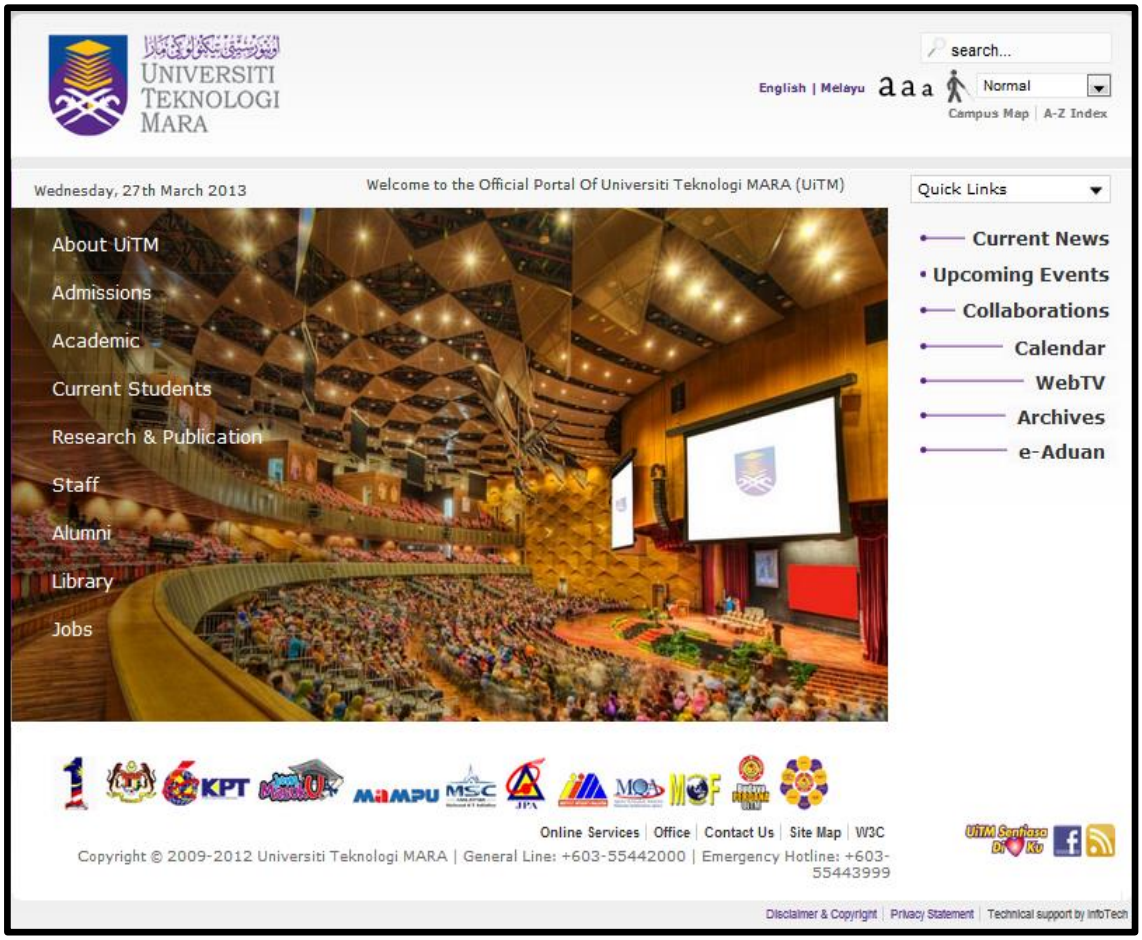

Figure 2.4: UiTM Website

2.7 Studies on Heuristic Evaluation

Heuristic evaluation is a discount usability engineering method for quick, cheap, and easy evaluation of a user interface design. It is the most popular of the usability inspection methods. Heuristic evaluation is done as a systematic inspection of a user interface design for usability. The goal of heuristic evaluation is to find the usability problems in the design so that they can be attended to as part of an iterative design process. Heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognized usability principles. It specifically involves evaluators examining the interface and judging its compliance with recognized

usability heuristic evaluation principles. Heuristic evaluations are one of the most informal methods of usability inspection in the field of human-computer interaction. There are many sets of usability design heuristics; they are not mutually exclusive and cover many of the same aspects of user interface design. Furthermore, heuristic evaluation is a good method of identifying both major and minor problems with an interface, but the lists of usability problems found by heuristic evaluation will tend to be dominated by minor problems, which is one reason severity ratings form a useful supplement to the method (Nielsen J, 1995). There are three collection of heuristic evaluation which is Norman's Seven Principles, Shneiderman's Eight Golden Rules and Jakob Nielsen's Ten Usability Heuristics.

2.7.1 Norman's Seven Principles

Norman's Seven Principles model of interaction in human computer interaction is the fact that is gives an understanding between the human and the computer and aim to facilitate the user's interaction with the system. The Design of Everyday Things is a best-selling book is about the design of simple objects, and why some objects please their users while others frustrate them. Norman uses case studies to describe the psychology behind what he deems good and bad design, and proposes design principles. The book spans several disciplines including behavioural psychology, ergonomics, and design practice. In the book, it helps in designing systems that facilitate the user in forming the correct actions and give the correct and expected feedback. Furthermore, the Norman's Seven Principles a widely recognized expert on design strongly believes that the things we use in our everyday lives should be easy to use and it should be more than obvious how to use them. Table 2.1 show the Norman's Seven Principles with descriptions.

Principles	**Descriptions**
Use both knowledge in the world and knowledge in the head *(conceptual models)*	Even though the design should facilitate intuitive operation, there should be consideration towards making it efficient for the experienced user. The designs are made intuitive by using the knowledge in the world. However, in some cases the user can internalize this knowledge
Simplify the structure of tasks	The tasks can be restructured or the designs can provide aids to make the same task simpler. There are four our approaches to make the tasks simples. First, keep the task same, but provide mental aids. Seconds, improve visibility, thus improving feedback and the ability to keep control. Third, automate the complex tasks, keeping them the same and lastly, restructure the tasks so that they are simpler.
Make things visible	Consider both visibility on the execution side of the action and the evaluation side. On the execution side, good visibility helps people to match their intentions to actions that can be executed on the system, bridging the so called Gulf of Execution. On the evaluation side, good visibility refers to feedback of system status and helps the users to evaluate the action's effects.
Get the mappings right	The designs should make sure that the user can determine the following mappings between intentions and possible actions; actions and their effects; actual system state and perceived state of the system and the needs and intentions of the user.
Exploit the power of constraints, both natural and	In formulating the right action, it would be helpful if the number of choices made available to the user was